

Chapter

5

FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

*for the Airport Master Plan
at Grand Canyon West Airport*

5.0 INTRODUCTION

One of the primary objectives of an airport planning study is the determination of future requirements for the airport, including the airfield, the terminal areas, and all other areas within the airport property boundaries. This airport planning study was developed to ascertain the level of changes in demand and trends currently experienced by the Grand Canyon West Airport, as well as to determine the airport developments necessary to accommodate future aircraft and passenger demand.

The purpose of this chapter is to establish general facility requirements for future development of the Grand Canyon West Airport. This chapter will lay out the specific airside and landside facilities which will meet the design standards according to the Airport Reference Code (ARC) and design aircraft group as determined in the preceding chapter, and will take into account any development constraints at the site.

As described in Chapter IV, Forecast of Aviation Activity, the existing ARC for the Grand Canyon West Airport is a B-I. Since the runway and apron do not have a paved surface, there is no weight class associated with this ARC. The future design aircraft is categorized as a "large" aircraft with a maximum certified weight of more than 12,500 pounds and less than 60,000 pounds, with an ARC of C-III. The ultimate design aircraft is a C-III weighing more than 60,000 pounds. These projections are based on unconstrained airport development, at either the existing site or an alternate site, which will provide the facilities required to accommodate these larger aircraft. Limitations placed on runway length at the existing airport site will in turn limit the aircraft ARC which will use the airport. A design aircraft with an ARC of A-II weighing less than 12,500 pounds is expected for the short-term, pursuant to paving the existing airfield surfaces.

5.1 AIRSIDE FACILITY REQUIREMENTS

The airside facilities of an airport are described as the runway configuration, the associated taxiway system, the ramp and aircraft parking area, and any visual or electronic approach aids.

5.1.1 Runway Requirements

Demand/Capacity: The Annual Service Volume (ASV) for the Grand Canyon West Airport was analyzed in Chapter IV, Forecast of Aviation Activity, Section 4.12. It was determined that Grand Canyon West Airport will operate within its capacity with one runway, even with the forecasted increase of aviation activity. Therefore, it is evident that the Grand Canyon West Airport will operate sufficiently with one runway for the twenty year planning period of this study.

Length: The FAA has developed a computer software program entitled "Airport Design" which provides the user with recommended runway lengths and other facilities on an airport according to certain criteria. The information which is required to execute the program for recommended runway lengths includes airfield elevation, mean maximum temperature of the hottest month, and the effective gradient for the runway. This specific information for the *existing* airport site at Grand Canyon West was used for the purposes of this portion of this study:

Field Elevation	4,825 Feet
Mean Maximum Temperature of Hottest Month	97.5° F
Effective Gradient	71 Feet

(Note: The actual difference in feet from runway end to runway end is required to run the FAA software program and is listed as the effective gradient. However, the effective gradient is usually shown as a percent, which is 1.53 percent for the existing runway at the Grand Canyon West Airport.)

With this data, the Airport Design program provides several runway length recommendations for both small and large aircraft according to varying percentages of aircraft fleet and associated takeoff weights. A summary of the data provided by the program is listed Table V-1.

TABLE V-1
EXISTING AND RECOMMENDED RUNWAY LENGTHS

Description	Runway Length
<i>Existing</i>	
Runway 17/35	5,200 feet
<i>Recommended to accommodate:</i>	
Small Aircraft (< 12,500 lbs.)	6,400 feet
Large Aircraft (> 12,500 lbs, < 60,000 lbs.)	
75 percent of these planes at 60 percent useful load	7,600 feet
75 percent of these planes at 90 percent useful load	9,330 feet
100 percent of these planes at 60 percent useful load	11,730 feet
100 percent of these planes at 90 percent useful load	11,730 feet

Source: FAA computer software program, Airport Design Version 4.1B

Using only the results of the FAA's software program, it would be fair to suggest that the runway at an airport serving Grand Canyon West should have a minimum length of 6,400 feet to accommodate the current design aircraft group (small aircraft) and a minimum length of between 9,330 and 11,730 feet to accommodate the future design aircraft group (large aircraft). However, there are certain factors that should be considered before these runway lengths are accepted as the final recommendation. These additional factors are discussed on the next pages.

Other runway length considerations:

1) Takeoff distance requirements for aircraft with an ARC of C-III.

When determining runway length requirements for any airport, it is imperative to consider the type of aircraft (aircraft design group and critical aircraft) which will be using the airport and their respective takeoff distance requirements. As an example, Table V-2 gives examples of takeoff distance requirements for the aircraft determined in Chapter IV to be typical aircraft of various ARCs which are expected to be using the Grand Canyon West Airport in the future.

As shown in the Table, an Embraer EMB-120 Brasilia with a takeoff weight of 24,000 pounds would require a runway length of 6,000 feet (using specific criteria as noted at the bottom of Table V-2). However, the same Embraer EMB-120 Brasilia when it weighs 25,353 pounds would require 7,025 feet of runway. Because of the high density altitude, the Beechcraft C99 Airliner cannot takeoff at its maximum gross takeoff weight (11,300 pounds) under the criteria listed above, and requires 5,000 feet of runway to take-off at 9,750 pounds. Due to the short flight of approximately 65 nautical miles (NM) one-way from Las Vegas (130 NM roundtrip), the fuel load required would be less than maximum, allowing for a full passenger load.

TABLE V-2
PERFORMANCE CHARACTERISTICS FOR AIRCRAFT POTENTIALLY
OPERATING AT THE GRAND CANYON WEST AIRPORT¹

Aircraft	Airport Reference Code	Takeoff Weight ²	Required Runway Length
Beechcraft C99	B-I	9,750	5,000
Learjet 25D/F	B-I	12,000	4,200
Learjet 25D/F	B-I	15,000	7,000
Learjet 35	B-I	13,000	3,932
DHC-6 Twin Otter	A-II	12,500	2,800
Beechcraft 1900C	B-II	15,245	5,800
Beechcraft 1900D	B-II	16,950	5,795
Embraer EMB-120 Brasilia	B-II	24,000	6,897
Embraer EMB-120 Brasilia	B-II	25,353	7,025
Falcon 20	B-II	18,000	3,532
Falcon 20	B-II	26,000	6,790
Merlin IVC	B-II	12,500	4,500
Merlin IVC	B-II	16,000	6,300
Grumman G-III	C-II	58,000	5,750
Grumman G-III	C-II	69,700	8,200
Boeing 727-100	C-III	140,000	8,950
DC-9-12	C-III	79,500	8,350
DC-9-13	C-III	83,750	9,400
DC-9-14	C-III	85,750	9,950
Grumman G-IV	D-II	63,000	6,900
Grumman G-IV	D-II	65,000	7,400
Grumman G-IV	D-II	73,600	10,000

¹ Aircraft performance data based on density altitude of 8,000 feet using a mean maximum temperature of the hottest month of 97.5°F and an airport elevation of 4,825 feet MSL.

² Some aircraft shown in this table may not be able to takeoff at maximum takeoff weight at this density altitude of 8,000 feet.

2) Primary travel destinations and distances by design aircraft

Although Table V-2 gives examples of the runway length requirements for various aircraft, it is also important to consider the origins and destinations of these aircraft from Grand Canyon West. For example, an aircraft having a takeoff weight of 12,000 pounds may be able to depart an airport which has a runway length of 4,200 feet, but may have to either decrease the fuel load or reduce the number of passengers to make it to the ultimate destination. This becomes extremely important for airports whose primary users or potential users operate for business reasons. For example, these business aircraft users may opt to use other airports because they can takeoff with full fuel and full passenger weight.

Trips from Grand Canyon West typically involve distances up to approximately 200 nautical miles (NM). Table V-3 provides a list of aircraft operating at Grand Canyon West Airport, their typical origin/destination, the aircraft range, and the required takeoff field length.

The runway length requirements as shown in the last column of Table V-3 are based on normal takeoff distance requirements using aircraft performance charts and the Aircraft Data (ACDATA) program version 6.02.

TABLE V-3
DESTINATIONS FROM GRAND CANYON WEST

AIRCRAFT TYPE	TAKEOFF WEIGHT	AIRCRAFT RANGE ¹	CURRENT & POTENTIAL DESTINATIONS FROM GRAND CANYON WEST	DISTANCE FROM GRAND CANYON WEST	REQUIRED FUEL STOPS	REQUIRED RUNWAY LENGTH ³
Cessna 208	8,000 lbs.	> 1,000 NM	North Las Vegas, NV	65 NM	None	1,875 feet
de Havilland DHC-6	12,500 lbs.	300 NM	Page, AZ	140 NM	None	2,800 feet
Cessna P210	4,000 lbs.	768 NM	Page, AZ	140 NM	None	3,600 feet
Beech C99	9,750 lbs.	1,100 NM	Las Vegas, NV Phoenix, AZ	65 NM 180 NM	None None	5,000 feet
deHavilland DHC-7	44,000 lbs.	720 NM	Las Vegas, NV Phoenix, AZ	65 NM 180 NM	None None	4,300 feet
de Havilland DHC-8	34,400	950 NM	Las Vegas, NV Phoenix, AZ	65 NM 180 NM	None None	5,250 feet

¹ Aircraft range is the approximate distance an aircraft can travel without a fuel stop and was determined using charts from the specific Aircraft Operating Handbook for the specific aircraft shown. Aircraft range uses the maximum takeoff weight, recommended cruise power, standard temperature, and zero wind conditions and allows for 45 minutes of reserve fuel.

² NM = Nautical Miles

³ Required runway length for each specific aircraft is based on the Normal Takeoff Distance requirements.

Summary: The FAA's software program, Airport Design, provides recommended runway lengths for airports based on certain information. However, it has also been shown that it is important to study other factors which may contribute to the decision on a recommended runway length. In the case of an airport to serve the Grand Canyon West area, the aircraft which are currently using or are forecasted to use the Grand Canyon West Airport have been shown to require a range of runway lengths from 1,875 feet (Cessna 208, Table V-3) to 6,897 (Embraer Brasilia, Table V-2) in the 0 to 10 year time frame, and up to 10,000 feet (DC-9-14, Table V-2) in the 10 to 20 year time frame. Considering the aircraft that are expected to utilize the airport, and the anticipated flight routes, it is recommended that the runway at Grand Canyon West area should have a length of 6,700 feet for future conditions, and 10,000 feet for ultimate conditions. This length will accommodate the aircraft in the 10 to 20 seat range that are expected to be predominant over the next 10 years, and the aircraft in the 100+ seat range which are anticipated in the long term.

Strength and Width: Runway strength requirements are normally based upon the design aircraft which may be expected to use the airport on a regular basis. For the Grand Canyon West Airport, the strength of the runway for the first five years of the study should be 30,000 pounds Single Wheel Gear (SWG) to accommodate small commuter and light business jet aircraft. A strengthening overlay should be completed to increase the strength to 60,000 pounds Dual Wheel Gear (DWG) when operations by large regional aircraft, such as the Canadair 601 Regional Jet, aircraft approach 500 per year. The pavement strength should be increased to 140,000 pounds Dual Wheel Tandem (DWT) when the runway is extended to accommodate heavy C-III aircraft such as the Boeing 727 and McDonnell Douglas DC-9.

The FAA recommends that runways which serve aircraft having an ARC of C-III should have a minimum width of 100 feet. This applies throughout all periods of this study.

5.1.2 Crosswind Runway Requirements

Meteorological data, specifically wind data, can be analyzed to determine the need for a crosswind runway at an airport. The recommendation by the FAA is that a runway should be oriented to handle aircraft at least 95 percent of the time under stipulated crosswind components. These crosswind components are displayed in Table V-4. If the wind coverage of the runway does not meet this 95 percent minimum for the appropriate ARC, then a crosswind runway should be constructed.

**TABLE V-4
ALLOWABLE CROSSWIND COMPONENTS**

Allowable Crosswind in Knots	Airport Reference Code
10.5 Knots	A-I & B-I
13.0 Knots	A-II & B-II
16.0 Knots	A-II, B-III, & C-I through D-III
20.0 Knots	A-IV through D-VI

As noted in Chapter II, Facility Inventory, analysis of wind data collected at Nelson, AZ indicated sufficient wind coverage with the existing runway alignment at Grand Canyon West Airport. This analysis was further supported by airport user survey responses, existing planning documents, and airport management personnel. An Automated Weather Observation System should be installed to record wind data at the airport and to provide pilots with current meteorological information.

5.1.3 Taxiway Requirements

Length and Width: The construction of parallel taxiways is primarily considered at airports which have at least 20,000 annual operations. Based on this recommendation and the aviation forecasts developed in Chapter IV, the Grand Canyon West Airport should have a full length parallel taxiway which serves the primary runway. In order to accommodate the airport's existing and ultimate design aircraft groups, this taxiway should be located a minimum of 400 feet from the runway centerline to the taxiway centerline and be at least 50 feet wide.

Strength: At the minimum, the strength of the taxiway should be maintained at a strength equal to that of the primary runway pavement.

5.1.4 Navigational Aids

A Navigational Aid (NAVAID) is any ground based visual or electronic device used to provide course or altitude information to pilots. NAVAIDS include Very High Frequency Omnidirectional Ranges (VORs), Nondirectional Beacon (NDBs), and Tactical Air Navigational Aids (TACANs), as examples. Currently, the Grand Canyon West Airport does not have any NAVAIDs. The closest NAVAID to Grand Canyon West Airport is the Peach Springs VOR.

Although NAVAIDs provide important information to approaching, departing, and en route pilots, it is not recommended that the Grand Canyon West Airport acquire their own NAVAID. Instead, it is a recommendation of this study that the existing airport continue to use the Peach Springs VOR for its approach and plan for a future nonprecision instrument Global Positioning System (GPS) approach, and an ultimate GPS precision instrument approach.

Nonprecision GPS approaches do not require ground based facilities on or near the airport, as a GPS uses satellites for navigation. Therefore, it involves little or no cost for the Airport Sponsor. GPS was developed by the United States Department of Defense for military use, and is now available for civilian use. GPS approaches are rapidly being commissioned at airports across the United States on a priority basis.

A precision instrument approach requires the use of the Wide Area Augmentation System (WAAS). This system provides signal correction to allow for approaches with lower minimums. The WAAS system is expected to be fully functional by the year 2001 and is a fraction of the costs of an Instrument Landing System (ILS) localizer and glide slope indicator.

5.1.5 Airfield Lighting and Marking

It is recommended that in the five to ten year time frame, the runway be equipped with pilot controlled Medium Intensity Runway Lights (MIRLs), as recommended in the FAA Advisory Circular (AC) 150/5340-24 for runways which have either visual or nonprecision approaches. Pilot controlled lighting is activated by clicks of the aircraft microphone; three times for low intensity, five times for medium intensity, and seven times for high intensity.

The parallel taxiway at the airport should be equipped with Medium Intensity Taxiway Lights (MITLs).

A standard rotating beacon should be installed for airport identification when lighting is installed at the airport. Also, the segmented circle and wind cones should be lighted at that time.

The runway should be marked initially with nonprecision instrument markings then precision instrument markings when the WAAS system is operational and the precision instrument approach is established.

5.1.6 Visual Aids

The existing Grand Canyon West Airport is not equipped with any visual aids. It is recommended that both ends of Runway 17/35 be equipped with Precision Approach Path Indicators (PAPIs) and Runway End Identifier Lights (REILs).

PAPIs, like VASIs, provide visual descent guidance information during the approach to the runway. The PAPIs consist of either two or four light units located to the left of the runway and perpendicular to the runway centerline. If the aircraft is above the glidepath, the pilot will see all white lights. If the pilot is on the proper glidepath, the light units closest to the runway will be red and those

farthest from the runway centerline will be white. When the pilot is below the glidepath all of the light units will be red. PAPIs have an effective visual range of approximately five miles during the day and up to 20 miles at night.

REILs are a pair of synchronized flashing lights located laterally on each side of the runway threshold. They provide rapid and positive identification of the threshold of a runway.

5.1.7 Aircraft Apron

The apron space requirements as shown in this planning document were developed according to recommendations given in AC 150/5300-13, "Airport Design", and AC 150/5360-13, "Planning and Design Guidelines for Terminal Facilities". Consideration must be made in the overall apron requirements for aircraft parking and tiedown requirements, taxilanes, adjacent taxiways, proximity to buildings, including the terminal, and gate positions. The apron layout should be such to accommodate small general aviation aircraft, commuter aircraft, and medium range commercial air carriers.

Tiedown Requirements: Aircraft tiedowns should be provided for those small and medium sized aircraft utilizing the airport. These aircraft risk being damaged or may cause damage or injury in sudden wind gusts if not properly secured. A number of tiedowns equivalent to the number of peak daily aircraft should be provided for general aviation and air taxi aircraft. Tiedown requirements for the 20 year planning period are listed in Table V-5.

Apron Requirements: Generally speaking, an apron tiedown area must allow approximately 360 square yards per aircraft. This square yardage per aircraft provides adequate space for tiedowns, circulation and fuel truck movement. Based on a need for 65 tiedowns, the general aviation/air taxi apron should have a minimum of 23,000 square yards by the year 2016, as shown in Table V-5.

Commercial Aircraft Parking and Apron Requirements: Several variables must be taken into consideration for commercial aircraft parking requirements. The size of the aircraft, which determines the gate type required, the method of parking, which includes taxi-in/taxi-out and taxi-in/push-out, and angled versus perpendicular parking. Using the guidelines in AC 150/5360-9 and assuming no more than two scheduled air carriers will serve Grand Canyon West within the planning period, three commercial aircraft parking positions will ultimately be required. Taxi-in/taxi-out operations are anticipated and a minimum wing tip separation of 25 feet is required for parked aircraft. Planning for the largest anticipated aircraft (B727-200) requires a Type A gate which encompasses approximately 4,500 S.Y. of apron per parking position. This includes the area required for taxi-in, turn around, and taxi-out, but does not include the apron taxilanes required to enter/exit the apron and access the taxiway and runway.

**TABLE V-5
APRON AND TIEDOWN REQUIREMENTS**

Year	Total Tiedowns Required	GA/Air Taxi Apron Required¹	Commercial Aircraft Parking	Commercial Apron Required²	TOTAL Apron Required¹
1997	24	8,600	0	0	8,600
2001	44	16,000	2	9,000	25,000
2006	44	16,000	3	14,000	30,000
2016	65	23,000	3	14,000	37,000

¹ Apron requirement in square yards (S.Y.).

² Parking positions only, does not include apron taxilanes.

5.2 LANDSIDE FACILITY REQUIREMENTS

Landside facilities are an equally important aspect of the airport. Landside facilities serve as the processing interface between the surrounding community and the airport operating environment. Likewise it offers the traveler the first impression of the airport and the local area. Landside facilities house the support infrastructure for airside operations and often generate substantial revenues for the airport. Landside facility requirements for Grand Canyon West Airport were developed using FAA planning guides which relate to facility requirements for nonhub locations and for general aviation operations. Careful consideration was given for the unique aspects of the Grand Canyon West area and the local tour operations conducted by the Hualapai Tribe.

5.2.1 Terminal Building

The construction of a terminal building at any airport offers many amenities to passengers, local and transient pilots, and airport management. Terminal buildings most often house public restrooms, public telephones, a pilot's lounge, and information regarding airport services.

In the case of the Grand Canyon West Airport, the terminal building is the processing point not only for air passengers, but also for the Hualapai Tour clients arriving by motorcoach and automobile. As the airport continues to grow, the terminal will not only support general aviation and air taxi operations, but also commercial carriers. The current terminal buildings which include a lobby/processing area, small information counter, gift shop, airport management office, and restroom have been adequate while the runway has remained unimproved; however, once the runway and apron are paved and air traffic increases, a new terminal will be needed.

Sizing of the facilities within the terminal building was based on the total forecasted peak hour passengers. The peak hourly air passenger figures calculated in Section 4.11 were applied to the planning charts found in FAA Advisory

Circular 150/5360-9, "Planning and Design of Airport Terminal Buildings at Nonhub Locations", to determine the estimated size of each respective terminal area.

The terminal at Grand Canyon West Airport also supports Hualapai Tour clients arriving by ground transportation. Therefore, ground passenger projections were established by Armstrong Consultants and the peak number of daily and hourly vehicles and visitors were calculated. These additional requirements were factored into the terminal building and parking requirements. The terminal building space requirements for Grand Canyon West Airport are detailed in Table V-6.

**TABLE V-6
TERMINAL BUILDING REQUIREMENTS**

GRAND CANYON WEST - TERMINAL REQUIREMENTS					
	Existing	1997	2001	2006	2016
SPACE REQUIRED FOR AIR PASSENGERS					
Lobby/Waiting Area	700	600	1600	1700	2800
Queing Area	700	150	1000	1100	1700
Airline Ticket Counters (Ln. Ft.)	10	10	50	60	85
Airline Office / Operations / Outbound Baggage	700	800	4200	5000	7000
Baggage Claim Area	0	400	1400	1500	1900
Baggage Claim Counter (Ln. Ft.)	0	20	45	55	80
Concessions	350	500	1500	1800	2500
Airport Management	350	500	500	750	1000
Mechanical	300	500	1500	1800	2500
TOTAL SPACE FOR AIR PASSENGERS	3,100	3,400	11,700	13,650	19,400
SPACE REQUIRED FOR GROUND VISITORS					
Lobby/Waiting	0	300	700	900	1300
Concessions	0	500	700	900	1300
HUALAPAI TOUR PROCESSING (All Visitors)					
Queing Area	0	400	1200	1500	2100
Counter Space	0	20	60	75	110
Additional Mechanical	0	200	400	500	700
TOTAL TERMINAL REQUIREMENTS					
Open Space (Sq. Ft.)	3,100	5,000	14,700	17,700	24,800
Counter Space (Ln. Ft.)	10	50	155	190	275

5.2.2 Hangar Facilities

Hangars are typically classified as either (1) T-Hangars (small single storage units which usually accommodate single engine aircraft only), or (2) Conventional hangars (small to very large units which accommodate a variety of aircraft types or corporate fleets). The number of aircraft that each conventional hangar can hold varies according to the manufacturer and the specifications of the airport owner or operator.

At Grand Canyon West Airport a significant number of based aircraft is not anticipated; therefore, an extensive hangar development area is not warranted. On the other hand, the construction of sun shades on the general aviation/air taxi apron would be a valuable asset to the airport, and to the airport users. Sun shades offer the aircraft protection from the high desert summertime heat which radiates on the apron and helps keep the aircraft, and in turn the passengers, cooler while waiting for the flight to depart. Larger aircraft enjoy the capability of operating their air conditioning system through the auxiliary power unit while on the ground or connecting to pre-conditioned air systems. Approximately thirty percent of the tiedown locations should be provided sun shades. This corresponds to a requirement of 27 sun shades through 2006 and 39 sun shades in 2016. Because sun shades limit the size of aircraft which can utilize the parking location and reduce flexibility of the apron, they should only be installed on the General Aviation/Air Taxi aircraft apron.

With the increasing number of aircraft operations anticipated for Grand Canyon West Airport, and the remote location, a Fixed Base Operator (FBO) may find it desirable to offer minor maintenance services at the airport. A hangar capable of housing four single engine or two twin engine aircraft should be sufficient. This FBO may also provide aircraft fueling services.

5.2.3 Aviation Fuel Facilities

Several factors should be considered when establishing fuel service at any airport. Two specific factors affecting fuel storage requirements at Grand Canyon West are aircraft operational capabilities and economics. The critical operational characteristic with respect to fueling services at Grand Canyon West Airport is the aircraft range. Range is the capability of the aircraft to make a round trip flight from its origin to Grand Canyon West and back with enough reserve fuel as to not require refueling. As seen in Table V-3, the range for virtually all of the example aircraft exceeds the round trip distance from their origin to Grand Canyon West Airport. In some instances the aircraft may need topped off to reach its destination with the required reserves. High density altitude will also require pilots to manage their fuel more closely in order to meet take off requirements. Both factors tend to minimize the demand for fuel.

This leads to the economics of fuel purchases. Due to the remote location of Grand Canyon West Airport, the retail price of aircraft fuel, both jet fuel and aviation gas (AV Gas), can be expected to be higher at Grand Canyon West than

at other surrounding Airports. Pilots will most likely purchase the minimum amounts of fuel required to make a safe takeoff and arrival at their destination. This will further tend to minimize the need for an extensive investment in fuel storage capacity.

That is not to say fuel will not be required. A 30 day supply of jet fuel and AV Gas should be available. The fuel may be stored in above ground tanks, underground tanks, trucks, or a combination thereof, although underground storage tanks are not recommended. Increasing helicopter operations to Grand Canyon West Airport and any based aircraft will in turn generate a demand for fuel. In the short and intermediate time frame a near equal distribution of jet fuel and aviation gas can be expected, with jet fuel consumption increasing to approximately a 66 percent ratio in the long term.

Fuel storage requirements are based on the average forecasted number of monthly operations (demand will be higher in the summer and lower in the winter) and a fuel ratio estimated by using fuel flowage data from the Grand Canyon National Park Airport and other surrounding airports, then reducing the factor to account for local variables at Grand Canyon West. The fuel storage requirement for based aircraft assumes that from one to five turboprop aircraft will be based at the airport, as recommended in Section 4.6.2, which consume 110.4 gallons of Jet-A fuel per hour with each flight being 1.5 hours long. The fuel storage requirements are shown in Table V-7.

**TABLE V-7
FUEL STORAGE CAPACITY REQUIREMENTS**

Fuel Storage Requirements				
	1997	2001	2006	2016
Annual Operations	20,700	37,900	35,800	55,000
Average Monthly Operations (AV Gas)	1,717	1,858	1,683	2,491
Average AV Gas Fuel Ratio (Gal.)	3.78	3.78	4.39	5.00
Total Monthly AV Gas Storage Required (Gal.) ¹	6,500	7,000	7,400	12,500
Average Monthly Operations (Jet-A)	8	1,241	1,216	1,966
Average Jet-A Fuel Ratio (Gal.)	5.04	5.04	6.50	8.00
Monthly Transient Aircraft Jet-A Requirement (Gal.)	40	6,255	7,904	15,728
Monthly Based Aircraft Jet-A Requirement (Gal.)	0	4,802	6,872	11,012
Total Monthly Jet-A Fuel Storage Required (Gal.) ¹	40	11,100	14,800	26,700

¹ Total fuel storage requirements rounded to nearest hundred gallon.

Fuel tanks located on an airfield should be situated at least 50 feet from any fixed or movable object. Examples of fixed or movable objects include aircraft parking spaces (tiedowns), hangars, office buildings, and auto parking areas. This not only reduces the risk of possible impacts to the tanks by aircraft, but also aids in the movement of vehicles around the tanks for fueling or tank refilling purposes.

When installing fuel tanks on an airport or relocating fuel tanks to a different site, it is also recommended that the tanks be installed in accordance with Environmental Protection Agency regulations to reduce the risk of spills, accidents, and contamination.

5.2.4 Parking

The Grand Canyon West Airport should provide adequate parking to accommodate airport employees, visitors arriving by automobile, and motorcoach tour busses. Because Grand Canyon West is a destination point versus an origin point, traditional planning formulas are not applicable in this case. Historically, visitors by automobile have averaged two percent of total Grand Canyon West visitors. Assuming two persons per automobile, and using the seasonal use trends and peak daily demand equations from Chapter IV, parking requirements were calculated. Based on these calculations, the parking area at Grand Canyon West Airport should ultimately accommodate 12 motorcoach busses and 29 automobiles in the planning year 2016.

5.2.5 Fencing

The airport property should be protected by a perimeter fence to be located outside of the Runway Object Free Area or Building Restriction Line. For Grand Canyon West Airport, this fence should be constructed of five strand barbed wire to a height of four feet. The fence is intended to prevent intrusions onto airport property by people and/or animals. It is also recommended that the Airport Sponsor construct a chain link fence between the automobile parking/public areas and the aircraft maneuvering areas (such as the parking apron and aircraft servicing areas). This will protect against inadvertent access by unauthorized personnel.

5.2.6 Airport Rescue and Fire Fighting (ARFF) Equipment

Although Airport Rescue and Fire Fighting Equipment is not required at non-certificated airports, it is highly recommended that at least one piece of equipment capable of expending water and foam be placed at the Grand Canyon West Airport. Due to the remote location of the airport, response by the closest municipal or Tribal fire departments would be unacceptable and could jeopardize life and property. Airport operations and maintenance personnel should be trained in operation of the equipment and in fire fighting procedures. Aviation rated fire extinguisher bottles should also be immediately available in the vicinity of the apron.

Upon the initiation of scheduled commercial service to Grand Canyon West, the airport may require Federal Aviation Regulation (FAR) Part 139 certification. In accordance with this regulation certain aircraft rescue and fire fighting equipment and agents are required depending on the index, or size, of the aircraft. A listing of the indexes and their corresponding ARFF requirements can be found in FAR Part 139.

5.2.7 Snow Removal Equipment

Recommendations for specific types of snow removal equipment that should be located at airports are found in FAA Advisory Circulars, 150/5220-20, Airport Snow and Ice Control Equipment, and 150/5200-30A, Airport Winter Safety and Operations. Grand Canyon West receives an average annual accumulation of snow, sleet, and hail of 5.6 inches. According to the standards set forth in AC 5200-30A, non-commercial service airports that have 10,000 to 40,000 annual operations should be able to clear one (1) inch of snow from the primary runway, one taxiway, and a portion of the apron in less than three hours. For non-commercial airports with over 40,000 operations the time limit is 2 hours. For a commercial service airport with 10,000 to 40,000 operations the time limit is one (1) hour, and for a commercial service airport with over 40,000 operations the time limit is one-half (1/2) hour.

For Grand Canyon West Airport to meet the first criteria, a simple displacement plow which can be attached to the front of an airport maintenance truck is sufficient. Once commercial service carriers begin operating at the airport, a friction testing device should be acquired along with an additional displacement plow and a push or tow-type sweeper broom. The sweeper broom is a valuable year-round tool to help reduce foreign object damage (FOD) and keep aircraft operating areas clean.

5.3 LAND USE COMPATIBILITY AND CONTROL

Zoning: Areas around airports can pose certain hazards to air navigation if appropriate steps are not taken to ensure that buildings and other structures do not penetrate the FAR Part 77 Imaginary Surfaces (described in Chapter II, Facility Inventory). The FAA therefore recommends that all Airport Sponsors adopt a zoning ordinance to protect these Part 77 Surfaces. A model of this type of zoning ordinance is included in the Appendix of this study. It is recommended that the Hualapai Nation establish a zoning ordinance for Grand Canyon West Airport and periodically review the existing height restrictions to ensure continued compliance with FAR Part 77.

Compatible land uses: In addition to ensuring that the Part 77 Surfaces are free from current and future obstructions, it is recommended that the Airport Sponsor make every effort to eliminate all incompatible land uses from the immediate area of the airport. For example, the FAA states in FAA Order 5200.5 (FAA Guidance Concerning Sanitary Landfills On Or Near Airports) and 40 CFR Part 257 (Criteria for Classification of Solid Waste Disposal Facilities) that landfills and/or transfer stations are incompatible land uses with airports. Therefore, these types of facilities should be located at least 5,000 feet from any point on a runway which serves piston type aircraft and 10,000 feet from any point on a runway which serves turbine type aircraft. Furthermore, any facility which may attract wildlife (especially birds) such as sewage treatment ponds and waste water treatment plants should also be located this same distance from any point of the runway.

5.4 SUMMARY

In summary, the facility requirements for the Grand Canyon West Airport are based on the types of aircraft using the existing airport now and those expected to use the airport in the future, as well as the projected air passengers and Hualapai Tour clients arriving by ground transportation. The proposed facilities are based on standards given in AC 150/5300-13, AC 150/5360-9, and in coordination with the Airport Sponsor, and the Federal Aviation Administration. The facility requirements assume unconstrained development to meet the aviation demand forecasted in Chapter IV and the standards for larger aircraft as discussed in this chapter. If it is not desirable to fully develop the airport at its existing location, due to proximity to the Canyon Rim, noise, and/or other concerns, then these facility requirements could be applied to an alternate airport site. Developing an airport to serve the Grand Canyon West area in accordance with these facility recommendations will enable the airport to serve its users in the best possible manner. The recommended airside and landside facilities are summarized in Table V-8 and V-9 below:

Table V-8

Recommended Airside Facilities					
Facility	Existing	1997	2001	2006	2016
Runway 17/35					
Length (feet)	5,200	5,200	6,700	6,700	10,000
Width (feet)	100	75	100	100	100
Strength (lb.)	N/A (Dirt)	12,5000 SWG	60,000 DWG	60,000 DWG	140,000 DWT
Parallel Taxiway					
Runway Separation (feet)	N/A	N/A	400	400	400
Length (feet)	N/A	N/A	6,700	6,700	10,000
Width (feet)	N/A	N/A	50	50	50
Strength (lb.)	N/A	N/A	60,000 DWG	60,000 DWG	140,000 DWT
NAVAIDS					
Approach Rwy 17	Visual	Visual	GPS Non-Precision	GPS Non-Precision	GPS-Precision
Approach Rwy 35	Visual	Visual	GPS Non-Precision	GPS Non-Precision	GPS Non-Precision
Lighting & Visual Aids					
Runway/Taxiway Edge	None / None	None / None	None / None	MIRL / MITL	MIRL / MITL
REILS RWY 17/35	None / None	None / None	None / None	Yes / Yes	Yes / Yes
Approach Lighting RWY 17/35	None / None	None / None	None / None	None / None	ODALs / None
PAPI RWY 17/35	None	None	PAPI / PAPI	PAPI / PAPI	PAPI / PAPI
Segmented Circle/Wind Cone/Beacon	No/Yes/No	Yes/Yes/No	Yes/Yes/No	Lighted/Lighted/Yes	Lighted/Lighted/Yes
Apron					
Tie Downs (GA/Air Taxi)	2	24	44	44	65
Apron Space for GA/Air Taxi (S.Y.)	6,700	8,600	16,000	16,000	23,000
Commercial Aircraft Parking	0	0	2	3	3
Commercial Aircraft Apron ¹ (S.Y.)	0	0	9,000	14,000	14,000
TOTAL APRON	6,700	8,600	25,000	30,000	37,000

¹Does not include apron required for taxilanes.

Table V-9

Recommended Landside Facilities					
Facility	Existing	1997	2001	2006	2016
Terminal Building					
Total Space (S.F.)	3,840	5,000	14,700	17,700	24,800
Access & Parking					
Automobile	30	6	15	18	29
Motorcoach/Bus	5	2	6	7	12
Access Roads	Dirt	Gravel	Asphalt	Asphalt	Asphalt
Hangar Facilities					
Hangars	0	0	1	1	1
Sun-Shades	0	0	0	27	39
Fuel Storage					
100 LL (gal)	None	5,000	10,000	10,000	15,000
Jet-A (gal)	None	None	10,000	15,000	30,000
Fuel Service	None	Airport Hours Only	24 hr Self Serve	24 hr Self Serve	24 hr Self Serve
Other:					
AWOS	No	No	Yes	Yes	Yes
Unicom	Unmonitored	Unmonitored	Monitored	Monitored	Monitored